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EXAMINER	
HOANG, ANN THI	
ART UNIT	**PAPER NUMBER**
2836	

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Please find below and/or attached an Office communication concerning this application or proceeding.

N·A

Office Action Summary	Application No.	Applicant(s)	
	10/828,889	SIBRAI, ANDREAS	
	Examiner	Art Unit	
	Ann T. Hoang	2836	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-33 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-6,12-16 and 18-21 is/are rejected.

7)☒ Claim(s) 7-11, 17, and 22-33 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 21 April 2004 is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 6/21/04, 2/17/05.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to because in Fig. 2, the numerical reference (280) is used twice for different pins in the circuit diagram. It appears that the connection pin on the low-side of squib (900) is labeled correctly, but that the connection pin between the safing sensor switch (630) and the switching device (410) should be labeled (820) instead of (280), in order to be consistent with page 24, line 10 of the disclosure. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

2. The disclosure is objected to because of the following informalities:

On page 1, line 5, the serial number of the related US patent application is 10/830,157.

On page 2, line 11, there appears to be a typo in "Alongside also necessary."

On page 9, line 7, the correct publication number for the US Patent Application of Boran et al. is 2002/0050826.

On page 25, line 13, it appears that numerical reference (116) should be replaced by (112) in order to be consistent with Fig. 2, which shows electrical lines (112, 115, 114, and 111) carrying voltage sensing signals (V_1, V_2, V_3, and V_4), respectively.

On page 25, line 14, it appears that the switch FET (410) should be referred to as P_1 in order to be consistent with Fig. 2.

On page 25, line 15, it appears that voltage V_1 should have the numerical reference (112) in order to be consistent with Fig. 2.

On page 25, line 18, it appears that the FET N_1 should have the numerical reference (420) in order to be consistent with Fig. 2.

Appropriate correction is required.

Claim Objections

3. Claims 12, 14, 22, 30 and 33 are objected to because the following phrases of the claims render the claims indefinite because it is unclear whether the limitation(s) following the phrase are part of the claimed invention:

In claim 12, the phrase "e.g." used in lines 2 and 3 of the claim.

In claim 14, the phrase "e.g.," used twice in line 3 and once in line 4 of the claim.

In claim 22, the phrase "i.e." used in line 46 of the claim.

In claim 30, the phrase "i.e." used in line 3 of the claim.

In claim 33, the phrases "inter alia" used in line 10 of the claim and "i.e." used in lines 46 and 72 of the claim.

4. Claim 15 is objected to because it appears that "The circuit according to claim 13" was meant to read, "The circuit according to claim 14," based on the pattern in previous claims. However, claim 15 as it is in its current recitation is not illogical.

5. Claims 20-21 and 28-29 are objected to because there is insufficient antecedent basis for the limitation "said switching transistor function" in lines 2-3 of the claims.

6. Claims 22 and 30 are objected to because there is insufficient antecedent basis for the limitation "said driver switch firing" in lines 33, 37, and 53 of claim 22 and line 2 of claim 30.

7. Claim 33 is objected to because the acronym "AVS" in line 19 of the claim should be defined.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 1-6, 12-16, and 19-21 are rejected under 35 U.S.C. 102(b) as being anticipated by Ueda et al. (US 5,977,651).

Regarding claim 1, Ueda et al. discloses a circuit, realizing a driver device for secure and reliable firing of an igniter or squib (11), connecting said squib via a high-side electronic switch (15, 19) to a power source (1) and via a low-side electronic switch (13) to circuit ground, incorporating separate power supply parts for high voltage and low voltage domains and equipped with elaborate intrinsic diagnostic and online testing features for circuit protection and operation securing purposes, comprising:

a means (4) for control of said firing, said diagnostics and said online testing;

a means (15, 19) for said high-side switching of said squib (11) to said power source (1);

a means (13) for said low-side switching of said squib (11) to said circuit ground;

a means (1, 22, 23) for said high voltage domain power supply;

a means (24, 25) for said low voltage domain power supply;

a means (22) for secured supply of electrical energy to said means (15, 19) for said high-side switching derived from said high voltage domain;

a means (14) for secured supply of electrical energy to said means (13) for said low-side switching derived from said low voltage domain;

a means (21) for driving said high-side switching means (15, 19) for said squib (11) controlled by said means (4) for control of firing, diagnostic and online testing and

supplying drive current to said high-side switching means (15, 19) either for the case of said diagnostic and online testing operations or for the case of said firing operation; and

a means for connecting said high-side switching means (15, 19) and said low-side switching means (13) to said means (4) for control of firing, diagnostic and online testing in order to execute said diagnostic measurement and online testing whereby in said case of diagnostic and online testing operations a switchable and controllable current flow is initiated in conjunction with appropriate voltage measurements and resistance evaluations thereby strictly observing that no firing conditions for said squib (11) are allowed to occur and whereby in said case of firing operation a secure firing of said squib (11) is always guaranteed.

See abstract; Fig. 2; column 4, lines 56-60; column 5, lines 35-41; and column 6, lines 8-20. Means (22) for secured supply of electrical energy to said means (15, 19) for high-side switching is included as part of means (1, 22, 23) for said high voltage domain power supply, as is the case in Applicant's disclosure and claim 12. Means (4) for control of firing is a collision detector that outputs a signal to be received by driver circuitry to activate a vehicle passenger air bag. See column 4, lines 21-33. An additional circuit, not shown in Fig. 2, implements the diagnostic and online testing, during which resistors (16, 17) allow a limited current to flow to squib (11) and voltage measurements are taken at various test points within the driver circuitry in order to determine the necessary behavior of the driver circuitry. The current through squib (11) is small enough so that it remains inactive in this phase. See column 4, lines 66-67; column 5, lines 1-8; and column 8, lines 35-47. Said means for connecting is shown in

Fig. 2 as wire connections as well as other components of the driver circuitry between means (4) for control of firing and high/low-side switching means (13, 15, 19). It is understood that the diagnostic and online testing circuit, not shown, would necessarily be connected to switching means (13, 15, 19).

Regarding claim 2, Ueda et al. discloses that said means (15, 19) for high side switching of said squib (11) to said power source (1) connects to one side of said squib (11) and that said means (13) for low-side switching of said squib (11) to said circuit ground connects to the other side of said squib (11), thus forming a switchable squib firing branch between said power source (1) and circuit ground. See Fig. 2. and column 4, lines 56-60.

Regarding claim 3, Ueda et al. discloses that said means (4) for control of said firing, said diagnostic and said online testing is subdivided into a means (4) for control of said firing and a means for said diagnostic and online testing. The reference discloses means (4) for control of said firing as a collision detector shown in Fig. 2. It is understood that these two means are subdivisions of a combined means for control of said firing, diagnostic and online testing. See column 4, lines 21-33 and 66-67; column 5, lines 1-8; and column 8, lines 35-47.

Regarding claim 4, Ueda et al. discloses that said means (15, 19) for high-side switching of said squib (11) to said power source (1) is realized as a controllable electronic switch in current mirror configuration. See Fig. 2; column 5, lines 23-26; and column 8, lines 1-10 and 50-60.

Regarding claim 5, Ueda et al. discloses that said current mirror configuration (15, 19) is driven by voltages not exceeding the high voltage domain supply voltage. Current mirror configuration (15, 19) is driven by means (22) for secured supply of electrical energy, which is a charge pump that is a part of means (1, 22, 23) for said high voltage domain power supply and which would therefore deliver a voltage equal to and not higher than the high voltage domain supply voltage. See Fig. 2; column 8, lines 55-57; and column 9, lines 1-2. The current mirror, driven by voltages equal to the high voltage domain supply voltage, would eliminate the need for an external and additional charge pump.

Regarding claim 6, Ueda et al. discloses that said current mirror configuration (15, 19) is implemented using FETs. See column 4, lines 49-51 and column 5, lines 19-26.

Regarding claim 12, Ueda et al. discloses that said means (1, 22, 23) for said high voltage domain power supply include generators and batteries (1) from a vehicle as a primary source, and derived there from separate secondary power sources implemented as charge pump devices (22). The reference discloses that driver circuitry for the squib (11) includes a power supply such as a vehicle battery (1) in column 4, lines 8-9, and it is understood that a generator from the vehicle would be included in the embodiment of power supply (1). It is also understood that the charge pump device (22) is operating in the same voltage range as said primary source (1), since charge pump device (22) is connected to primary source (1) to increase the voltage across

primary source (1) for storage in a storage capacitor (2), which acts as a backup for the primary source (1). See Fig. 2 and column 5, lines 49-54.

Regarding claim 13, Ueda et al. discloses that said means (1, 22, 23) for said high voltage domain power supply also includes a controlled current source (23) for said high-side switching device (15, 19). See Fig. 2 and column 5, lines 54-58.

Regarding claim 14, Ueda et al. discloses that said means (24, 25) for said low voltage domain power supply is a separate power source from that of the high voltage domain power supply and shows said means (24, 25) for said low voltage domain power supply as a primary source in the form of a battery (25) in Fig. 2. It is understood that a generator from the vehicle would be included in the embodiment of power supply (24, 25). The reference also discloses that battery (25) of means (24, 25) for said low voltage domain power supply is operating within a reduced low voltage range. See column 8, lines 13-14.

Regarding claim 15, Ueda et al. discloses that said means (24, 25) for low voltage domain power supply also include controlled current sources (24n, 24o) for said low-side switching device. Means (24, 25) for low voltage domain power supply includes an operational amplifier (24), inside of which are controlled current sources (24n, 24o), for feeding a suitable voltage to the control terminal of low-side switching means (13). See Figs. 2 and 4 and column 6, lines 8-9.

Regarding claim 16, Ueda et al. discloses that said means (22) for secured supply of electrical energy to said means (15, 19) for said high-side switching derived

from said high voltage domain consists of a charge pump feeding a controlled current source (23). See Fig. 2 and column 5, lines 49-56.

Regarding claim 19, Ueda et al. discloses that said means for connecting said high-side switching means (15, 19) and said low-side switching means (13) to said means (4) for control of firing, diagnostic and online testing comprises, on one hand, output control signal lines leading to said means (21) for driving said high-side switching means (15, 19) and leading to said means (14) for secured supply of electrical energy to said means (13) for said low-side switching derived from said low voltage domain and, on the other hand, input measurement signal lines from said high-side switching means (15, 19) of said squib (11) and from said low-side switching means, as well as power supply and ground connections. See Fig. 2, which shows control signal lines coupled the inputs terminals of means (21) for driving said high-side switching means (15, 19), a control signal line coupled to the control terminal of means (14) for secured supply of electrical energy to said means (13) for said low-side switching, measurement signal lines carrying the source voltages of high-side switching means (15, 19) of said squib (11), and a voltage measurement across a resistor (18) parallel with low-side switching means (13). Also see column 4, lines 21-33; column 5, lines 9-18; and column 7, lines 22-30. As it is shown that means (4) for control of firing outputs a signal into a line connected to the driver circuitry, it is understood that the additional circuit that implements the diagnostic and online testing is necessarily connected to the driver circuitry via signal lines as well. It is inherent that the means for control of firing,

diagnostic and online testing would be connected to a power supply and ground during operation.

Regarding claim 20, Ueda et al. discloses said means (15, 19) for said high-side switching of said squib (11) to said power source (1). Firstly, it is understood that the driver circuitry includes a switching transistor function for controlled firing operation and for onsite test diagnostics, as these would be necessary for collision detector (4) to output signals to be received by the driver circuitry to switch high-side switching means (15, 19), and for the additional onsite test and diagnostics circuitry to implement the diagnostic and online testing, which involves the switching of high-side switching means (15, 19). See column 4, lines 21-33 and 66-67. Secondly, the reference also discloses controlled current source (23) to play a role in driving high-side switching means (15, 19), thus controlling firing operation with current limitation. See Fig. 2. Thirdly, onsite test diagnostics are understood to be included in the additional onsite test and diagnostics circuitry. Thus, the switching transistor function, controlled firing operation with current limitation, and onsite test diagnostics are understood to be included in the operation of the means (15, 19) for high-side switching of squib (11).

Regarding claim 21, Ueda et al. discloses said means (13) for said low-side switching of said squib (11) to said circuit ground. Firstly, it is understood that the driver circuitry includes a switching transistor function for controlled firing operation and for onsite test diagnostics, as these would be necessary for collision detector (4) to output signals to be received by the driver circuitry to switch low-side switching means (13), and for the additional onsite test and diagnostics circuitry to implement the diagnostic

and online testing, which involves the switching of low-side switching means (13). See column 4, lines 21-33 and 66-67. Secondly, the reference also discloses controlled current sources (24n, 24o) to play a role in driving low-side switching means (13), thus controlling firing operation with current limitation. See Figs. 2 and 4. Thirdly, onsite test diagnostics are understood to be included in the additional onsite test and diagnostics circuitry. Thus, the switching transistor function, controlled firing operation with current limitation, and onsite test diagnostics are understood to be included in the operation of means (13) for low-side switching of squib (11).

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ueda et al. (US 5,977,651) in view of Abe (US 2002/0125950). Ueda et al. discloses that said means (21) for driving high-side switching means (15, 19) for said squib (11) consists of a stacked current mirror circuit made up of four BJTs (21d, 21e, 21f, 21g) serving as a current source for said high-side switching device (15, 19). The stacked current mirror circuit is part of an operational amplifier (21). See Figs. 2-3 and column 9, lines 6-24. In the reference, the four transistors (21d, 21e, 21f, 21g) of operational amplifier (21)

serving as a current source are not FETs and it is not specified that high-side switching device (15, 19) is a circuit implemented in CMOS technology.

However, Abe discloses a CMOS operational amplifier (10) consisting of a stacked current mirror circuit (4a, 4b) made up of four FETs. See Fig. 1. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the stacked current mirror circuit made up of four FETs in the CMOS operational amplifier of Abe to drive the high side switching means of Ueda et al. in order to provide the advantages of reduced power consumption and heat dissipation associated with FETs and CMOS implementation. Furthermore, it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the high-side switching device circuit of Ueda et al. in CMOS technology in order to manufacture the high-side switching device and the means for driving the high side switching means via a uniform technology, in addition to providing reduced power consumption and heat dissipation.

Allowable Subject Matter

12. Claims 7-11 and 17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The following is a statement of reasons for the indication of allowable subject matter:

Regarding claims 7-8, prior art fails to teach that the FETs are of the PMOS type manufactured in CMOS technology, in combination with the other limitations recited in the claims.

Regarding claims 9-11, prior art fails to teach that said means for said low-side switching of the squib to circuit ground is implemented using a controllable electronic switch in current mirror configuration, in combination with the other limitations recited in the claims.

Regarding claim 17, prior art fails to teach that the means for secured supply of electrical energy to the low-side switching means derived from the low voltage domain consists of two controlled current sources fed by voltages out of a low voltage domain for switching between different currents for current limiting and diagnostic testing purposes, respectively, in combination with the other limitations recited in the claims.

13. Claims 22-32 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims. The following is a statement of reasons for the indication of allowable subject matter:

Regarding claims 22-32, prior art fails to teach a circuit realizing a driver device for secure and reliable firing of an igniter or squib, comprising a power source connected and reverse battery protected by a series power diode, an output connector pin for a 'Fuel Cut-Off' signal, an output connector pin for a 'Diagnostic Lamp Driver' signal, a controllable current source for driver switch diagnostics of a high-side switch, a controllable current source for driver switch firing of a high-side switch, a controllable current source for driver switch diagnostics of a low-side switch, and a controllable current source for driver switch firing of a low-side switch, in combination with the other limitations recited in the claims.

14. Claim 33 would be allowable if rewritten to overcome the claim objection set forth in this Office action and to include all of the limitations of the base claim and any intervening claims. The following is a statement of reasons for the indication of allowable subject matter:

Regarding claim 33, prior art fails to teach a method for controlled operation and secure firing of igniters or squibs, comprising implementation of a low-side switching device with the help of a pair of NMOS transistors in current mirror configuration; implementing a high-side driver controlled by a pair of switchable current sources, whereby one current source defines normal diagnostic and test operations and the other current source a firing operation; implementing for said low-side switching device a current source that defines the normal diagnostic and test operations and the other current source the firing operation; and calculating secure firing current values for said high-side and said low-side switching devices, thus trimming, or setting up said controlled driving currents to their operational necessary minimum, and thus limiting said main supply energy stored within said external storage capacitor to an optimum, in combination with the other limitations recited in the claims.

Conclusion

15. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Bennett et al. (US 5,734,317) discloses a MOS driver circuit for firing of a squib having a high-side switch and a low-side switch and a current mirror as a drive limit controller. Fendt et al. (US 6,456,915) discloses a driver circuit for firing of

an airbag igniter having a high-side switch and a low-side switch and a current mirror as a current measurer. Tanaka et al. (US 5,675,278) discloses a CMOS operational amplifier consisting of a stacked current mirror circuit made up of four FETs.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ann T. Hoang, whose telephone number is 571-272-2724. The examiner can normally be reached Mondays through Fridays, 8:00 a.m. to 5:00 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian Sircus, can be reached at 571-272-2058. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ATH
02/14/06

PHUONG T. VU
PRIMARY EXAMINER